For Reference

AIEA HILLSIDE SUBDIVISION
PRELIMINARY SOIL REPORT

AIEA, EWA, OAHU, HAWAII
TAX MAP KEY: 9-9-07: 2

DEPT OF
LAND UTILIZATION
C & C HONOLULU

To:
DAVID TAOGOSHI GENERAL CONTRACTING, INC.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

AUGUST 27, 1973
MR. DAVID TAOGOSHI
David Taogoshi General Contracting, Inc.
99-128 Aiea Heights Drive
Aiea, Oahu, Hawaii 96701

Dear Mr. Taogoshi:

Subject: Aiea Hillside Subdivision
Preliminary Soil Report
(site grading for residential development)
Aiea, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-07: 2

In accordance with your request, soil explorations were made to evaluate general soil conditions for site grading for residential development for the proposed Aiea Hillside Subdivision at Aiea, Ewa, Oahu, Hawaii.

The surface soils at the site may be generally described as medium to stiff reddish-brown and brown silty clays (MH-CH) and clayey silts (MH) with some pockets of clays (CH soils).

Post-and-beam type foundations are generally recommended because the site is mostly a sloping area.

Slab-on-ground type construction may be considered for several lots in the southwestern portion of the site where the existing ground is fairly level.

Where the ground slopes are steeper than about 4 horizontal to 1 vertical, the house foundations should be designed for the location and type of structures contemplated.

Field adjustments should be done where "CH" clay pockets are encountered during construction.

Some grading of the site is contemplated. The earthwork should be done in accordance with the requirements of the Revised Ordinances of Honolulu, 1969 As Amended and the recommendations contained herein.

This report includes a Boring Location Sketch, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By

Ezra Koike
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SC:OPE OF EXPLORATION

The purpose of this exploration was to get an indication of general soil conditions for site grading for residential development for the proposed Aiea Hillside Subdivision at Aiea, Ewa, Oahu, Hawaii.

This report includes field explorations, laboratory tests, general recommendations for site grading and residential foundation design and limitations.

FIELD EXPLORATION

Eight exploratory borings were made at the site. The locations of these borings are shown on the Boring Location Sketch. Descriptions of the underlying soils encountered are shown on Boring Logs Nos. 1 thru 8.

Borings were made with 3 and 4-in. diameter augers using carbide drag bits and finger type bits. Soil samples were recovered with a standard split spoon sampler driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content, Atterberg limit, grain-size analysis, AASHO T-180-57 density, expansion and CBR.
A summary of the laboratory test results is given in Tables IA thru IC.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

SOIL DESCRIPTIONS BY OTHERS


p. 94: Manana silty clay loam, 2 to 6% slopes (MH soils)

p. 119: Rockland (rRK)

GENERAL SITE CONDITIONS

The proposed residential site is located on the southeasterly side of Aiea Heights Drive about 1-1/2 to 2 miles mauka of Kamehameha Highway. The North Fork of Aiea Stream is located along the eastern boundary.

The average rainfall at the proposed site may vary from 50 to 75 in. annually.

The proposed residential site may be roughly described as follows:

Upper Area (Westerly Side)

The upper area generally slopes down in southerly and easterly directions at about 3 to 20% gradients. Portions
of the upper area appeared to be partially graded. Grass and weeds generally cover the site with trees interspersed in several areas. A vegetable garden was noticed in this area.

Existing wood-frame houses are located next to Aiea Heights Drive.

A stockpile of earth (about 6 to 12 ft high) mixed with some concrete rubbles was noted next to Aiea Heights Drive just mauka of the existing houses. An earth swale about 1 to 2 ft deep crosses the south side and drains in an easterly direction.

Sloping Area (Easterly Side)

The eastern portion of the site generally slopes down toward the North Fork of Aiea Stream at about 20 to 100% gradients with localized variations. Most of the sloping area was overgrown with grass, shrubs and trees. Some boulders or rock outcrops and several eroded spots were noted in localized areas. Some rubbish and debris were also noted in localized areas.
INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils encountered in the borings may be generally approximated as follows:

- Medium to stiff reddish-brown and brown silty clays (MH-CH) and clayey silts (MH) with some decomposed rock to about 8 to 40-ft depths. Below that was decomposed rock or rock to about 9 to 41.5 ft, the depths drilled.

- Decomposed rocks were generally encountered at shallow depths along the lower portions of the sloping area (Boring Nos. 4, 5 and 8).

- Clay (CH) pockets were encountered in Boring Nos. 1 and 2.

Water was not noted in the borings during the field explorations.

Variations to the above soil conditions are to be expected in localized areas. For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

In general, the present plan is to develop the site for residential lots. The preliminary plans indicate minor fills. Cuts of about 10 ft are proposed for an access roadway.
In general, grading work should be kept to a minimum or designed mostly with low cuts, particularly along the sloping areas on the easterly side of the site.

Cut and fill slopes and building foundations will require field adjustments when "CH" clay pockets are encountered.

**Site Grading**

Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling.

Provisions to drain the site should be included during and after the completion of filling operations.

Grading work should be done in accordance with the Revised Ordinances of Honolulu, 1969 As Amended and as recommended below:

1. The area should be cleared and grubbed.

2. Stockpiled soils and topsoil should be stripped to stiff natural ground before the placement of fills.

3. Hard surfaces such as along the existing unpaved road should be scarified down to stiff soils and recompacted to match the density of the surrounding soil.
4. Where fills are proposed in drainage swales, loose material at the bottoms and sides should be stripped down to stiff natural ground before the placement of fills.

5. Thin sidehill fills (sliver fills) on sloping areas should be avoided.

6. On-site clay soils should generally be placed on fairly level areas in the deeper portions of fills and away from the face of slopes. Selected on-site soils or borrow soils should be placed in the upper 2 ft of fills and in the outer portions of slopes, if practicable.

7. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill should be bench to a generally level condition. As the fill is brought up, it should continually be keyed into the stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.
8. If boulders are proposed to be used in the construction of fills, they should be generally placed along the toe sections of fill slopes and outside of probable building sites. Before placing any boulders, the subgrade should be stripped to stiff natural ground and shaped to drain. A layer of select material or low grade concrete should be placed on the subgrade and the boulders placed on the select material or low grade concrete. The void spaces between boulders should be filled with smaller granular material. A blanket of filter material should be placed against the boulders before earth fills are placed against the boulders. See attached sketch, Figure 1.

9. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method. In roadway areas, the top 2 ft of fill should be compacted to 95% of the maximum density.

10. Provisions to drain the site should be included during and after filling operations.
Slopes

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used.

If slope heights (top to toe) of greater than 15 ft are considered, 8-ft-wide benches should be placed at height intervals of about 15 ft.

To minimize erosion, the runoff from rainstorms should be diverted by berms or ditches away from slopes whenever practicable.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Slope adjustments should be made or other precautions should be taken if clay (CH) pockets or seepage zones are encountered in localized areas. Where clay (CH) pockets are encountered, the clay soils should be removed from the outer portion of the slope and replaced with select granular soils.

Foundations

Post-and-beam type construction is generally recommended because the site is mostly a sloping area.
Slab-on-ground type construction may be considered for several lots in the southwestern portion of the site where the existing ground is fairly level.

Buildings on fairly level ground

For buildings located away from the tops of slopes on fairly level sites, conventional foundations such as slab-on-ground and post-and-beam construction may be used.

If clay "CH" soils are encountered in the building area, foundation adjustments should be made in the field. In general, about 2 to 3 ft of the clay soils should be excavated and replaced with select material below footings and slab-on-ground.

Buildings on sloping ground

For buildings located on sloping ground or near the tops of slopes, post-and-beam construction is recommended.

To minimize the effects of slope creep, the foundations should extend down to decomposed rock or to a depth below a 4:1 plane drawn upward from the toe of slope. Foot blocks may be supported on short pipe piles. The foot blocks should be tied together up and down the slope (see Figure 2).
For sloping ground steeper than about 4 horizontal to 1 vertical, foundations should be designed for the location and type of structure contemplated.

General foundation guidelines
1. Because of downhill creep effects of soils on slopes, it is preferable that buildings be placed about 15 ft away from the tops of slopes.

2. Construction of retaining walls on slopes should generally be avoided.

3. Next to or along the tops of slopes, structures should be designed as small units or floating platforms or decks resting on posts and beams that will allow the floors to be releveled should settlements occur. Odd-shaped and split level structures should be minimized or designed to float as a unit.

4. Bearing values for a given soil usually vary with the size and depth of footings. For the proposed light, wood-frame structures, bearing values of about 2000 p.s.f. may be used for footings on stiff natural ground or on compacted fills.
Loads of about 6000 pounds per pipe pile or deep footings may be considered.

5. Soft spots or pockets of loose material encountered in footing excavations or below the building area should be excavated and replaced with selected on-site or borrow material.

6. Concrete slabs on ground should be placed over a base course of 4 in. of well-graded gravel less than 3/4-in. and greater than 1/4-in. in size. The subgrade should be compacted and shaped to a level surface or to drain if practicable, and generally should be kept slightly higher than the finish grade outside the building.

7. Good surface drainage away from the foundations of structures should be maintained and the site should be graded to prevent the ponding of water.

Roadway and Parking Area

In general, for the light automobile traffic and drained subgrade conditions, an estimate of the roadway pavement thickness may be as follows:

2. Base course  - 6-in. base course.

3. Subbase  - 6-in. select borrow over a prepared subgrade.

Provisions should be made in the contract documents to allow for local adjustments regarding select borrow subbase and borrow material requirements in the field in accordance with the design standards of the City and County of Honolulu. In fill areas, the use of select soils within the top 2 to 3 ft of the subgrade may reduce the thickness of or eliminate the need for the select borrow subbase or borrow courses.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels thru the walls of the catch basins which are placed in these low areas.

Underground Utilities

Underground utilities should be placed after the fills are constructed.

The bottom of utility trenches should be daylighted and graded to shed water, particularly near the tops of slopes. The backfill and drainage of these utility trenches should be carefully designed.
Flexible connections should be used.

**Unforeseen Conditions**

Unforeseen or undetected conditions such as soft spots, seepage water or expansive soil pockets may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

**Site Regrading**

After mass grading work is done and cuts and fills are made according to the grading plan, regrading at some future date should be avoided unless done under the guidance of a soils engineer.
PROPOSED SPECIFICATION FOR EARTHWORK
AIEA HILLSIDE SUBDIVISION

General Description

This item shall consist of clearing and grubbing, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and subsidiary work for grading the site.

Clearing, Grubbing and Preparing Areas to be Filled

Vegetation, rubbish and miscellaneous material shall be removed and disposed of, leaving the disturbed area with a neat, debris-free appearance.

Topsoil and stockpiled soils shall be stripped to stiff natural ground before the placement of fills. Loose surface soils encountered at finish grade shall be scarified and recompacted.

Hard surfaces of the existing dirt road shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

Where fills are proposed in drainage swales, loose material at the bottom and sides should be stripped down to stiff natural ground before the placement of fills.

Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill shall be benched to a generally level condition. As the fill is brought up, it shall continually be keyed into the stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.
Materials

Fill material shall consist of selected on-site soils or approved borrow soils. The soils shall contain no more than a trace of organic and deleterious matter.

Borrow soils shall be select soils generally less than 6-in. maximum size, with more than 30% fines passing the No. 200 sieve and a plasticity index generally less than 20.

Fill material placed in the top 2 ft of fills shall contain less than 30% gravel.

Placing, Spreading and Compacting Fill Material

The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and blade-mixed during the spreading to attain uniformity of material and water content within each layer.

Rocks or cobbles shall not be allowed to nest, and voids between rocks shall be filled and compacted with small stones or earth.

When the water content of the fill material is well below the optimum for compacting purposes, water shall be added until the water content is near the optimum.

When the water content of the material is well above the optimum for compacting purposes, the fill material shall be aerated by blading or by other satisfactory methods until the water content is near the optimum.
After each layer has been placed, mixed and spread evenly, it shall be compacted to 90% of maximum density in accordance with AASHO Test No. T-180-57 or other comparable density tests. For fills in roadway areas, the top 2 ft of fill shall be compacted to 95% of the maximum density. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified water content. The rolling of each layer shall be continuous over its entire area, and the roller shall make sufficient passes to obtain the desired density.

Field density tests shall be made to get an indication of the compaction of the fill. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

Boulder Fills

If boulders are used for the construction of fills, they shall be generally placed along the toe section of slopes. The subgrade shall
be stripped to stiff natural ground, shaped to drain and a layer of select material or low grade concrete shall be placed on it. Voids shall be filled with smaller granular soils. A blanket of filter material shall be placed against the boulder fill before construction of fills against it.

**Excavation**

Suitable material from excavation shall be used in the fill and unsuitable material from excavation shall be disposed of.

**Unforeseen Conditions**

If unforeseen or undetected soil conditions such as soft spots, seepage water or expansive soil pockets are encountered, corrective measures shall be made in the field as they are detected.

**Rainy Weather**

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests indicate that the water content and density are as previously specified.
BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.
Boring Log

PROJECT: AIEA HILLSIDE SUBDIVISION

LOCATION: Aiea, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-07: 2

HAMMER:
- Weight: 140#
- Drop: 30"

SAMPER: 2" STANDARD SPLIT SPOON

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LOCATION: Aiea, Ewa, Oahu, Hawaii

Type of Boring: AUGER (MOBILE)

Diam: 4"

Elev. Datum: 702' ± *

Drill Bit: T.C. DRAG

Field Party: SETO, KAIMANA, SUZUKI

Driller: W. LUM ASSOC, INC.

Date: JULY 25 1973

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<td>I-B</td>
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<td>I-H</td>
<td>51</td>
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END OF BORING, E 91.5'
1-27-73

* Elev. Estimated from Preliminary Subd. Plan by Sunn, Low, Tom & Hara, Inc.

Dated 5/25/73

NOTE:

LL= LIQUID LIMIT
PL= PLASTIC LIMIT
**Boring Log**

**PROJECT**  AIEA HILLSIDE SUBDIVISION  
**LOCATION**  Aiea, Ewa, Oahu, Hawaii  
**Tax Map Key:**  9-9-07: 2

**HAMMER:**
- **Weight:** 140 lbs  
- **Drop:** 30"  
**SAMPLER:**  2" STANDARD SPLIT SPOON

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### PENETRATION DATA

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|                        | MOTTLED REDDISH BROWN  
|                        | SILTY CLAY W/ ROOTS,  
|                        | GRAVEL & SOME  
|                        | DECOMPOSED ROCK        |            | 2-B         | 31            |                 |                 |            |                          |
|                        | STIFF, REDDISH BROWN  
|                        | CLAY            | 2-C         | 34            |                 |                 |                 |            |                          |
| **(CH)**                | STIFF        | 10          | 2-D         | 41            |                 |                 |            |                          |
|                        | MOTTLED DARK BROWN  
|                        | SILTY CLAY W/ TRACES OF  
|                        | DECOMPOSED ROCK        |            | 2-E         | 42            |                 |                 |            |                          |
| **(MH)**                | STIFF        | 15          | 2-F         | 50            |                 |                 |            |                          |
|                        | MOTTLED GRAY BROWN  
|                        | CLAYEY SILT W/ TRACES OF  
|                        | DECOMPOSED ROCK        |            | 2-F         | 50            |                 |                 |            |                          |
| **(MH)**                | STIFF        | 20          | 2-G         | 50            |                 |                 |            |                          |
|                        | MOTTLED GRAY & BROWN  
|                        | CLAYEY SILT W/ TRACES OF  
|                        | DECOMPOSED ROCK        |            | 2-H         | 51            |                 |                 |            |                          |
| **(MH)**                | STIFF        | 25          | 2-H         | 50            |                 |                 |            |                          |
|                        | MOTTLED DARK BROWN  
|                        | CLAYEY SILT W/ TRACES OF  
|                        | DECOMPOSED ROCK        |            |              |                 |                 |            |                          |
| **(MH)**                | STIFF        | 30          |              | 50            |                 |                 |            |                          |
|                        | MOTTLED RED & DARK BROWN  
|                        | SILTY CLAY W/ SAND  
|                        | (DECOMPOSED ROCK)      |            | 2-H         | 50            |                 |                 |            |                          |

**END OF BORING & 50'**

7-26-73

* Elev. Estimated from Preliminary Subd.  
Plan by Sunn, Low, Tom & Hara, Inc.  
Dated 5/25/73

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**NOTE:**
- LL = LIQUID LIMIT
- PL = PLASTIC LIMIT

**HAMMER:**
- **Date:** JULY 25, 1975  
- **Driller:** WALTER LUM ASSOCIATES, INC.  
- **Drill Site:** SECO, KAIMANA  
- **Drill Site:** (MOBILE)  
- **Diam.:** 4"  
- **Type of Boring:** AUGER (MOBILE)  
- **Elev.:** 752' ± 2x  
- **Water Level:**  
- **Time:**  
- **Date:** 12/25/73  

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**HAWAII**  
**Plan by Sunn, Low, Tom & Hara, Inc.  
Dated 5/25/73**
## Boring Log

**PROJECT**  
AIEA HILLSIDE SUBDIVISION

**LOCATION**  
Aiea, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-9-07: 2

**HAMMER:**
- **Weight:** 140 lbs
- **Drop:** 90"

**SAMPLER:** 2" STANDARD SPLIT SPOON

### Standard Penetration Test Data

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<td><strong>MH</strong></td>
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<td>STIFF, DARK BROWN CLAYEY SILT W/TRACE OF ROOTS &amp; GRAVEL</td>
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*Elev. Estimated from Preliminary Subd. Plan by Sunn, Low, Tom & Haral, Inc.*

**DATE:** DATED 5/25/73
Boring Log

PROJECT: AIEA HILLSIDE SUBDIVISION

LOCATION: Aiea, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-07: 2

HAMMER:
Weight: 140 lbs
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

<table>
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<th>Unified Soil Classification</th>
<th>DESCRIPTION</th>
<th>ELEV.</th>
<th>Depth (ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Wet Visc. (%)</th>
<th>Dry Visc. (%)</th>
<th>Unconf. Comp. (%)</th>
<th>P.K.</th>
<th>P.S.F.</th>
<th>P.S.F.</th>
<th>N (Blows per foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(MH)</td>
<td>STIFF, MOTTLED BROWN</td>
<td>0</td>
<td></td>
<td>4-A</td>
<td>34</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>SILTY CLAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ORGANIC MATTER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(MH)</td>
<td>STIFF, REDDISH BROWN</td>
<td></td>
<td></td>
<td>4-B</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SILTY CLAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MH</td>
<td>MEDIUM, STIFF, MOTTLED REDDISH BROWN GRAY Silt w/ traces of organic matter &amp; sand</td>
<td>1</td>
<td>9</td>
<td>4-C</td>
<td>57</td>
<td>LL= 60</td>
<td>PL= 38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>COBBLE OR BOULDER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>END OF BORING @ 9' 8-2-73</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: AT 8', CHANGED TO T.C. DRAG BIT, DRILLED FOR 35 MIN. 8'-4'. MOVED HOLE 5' NORTH, DRILLED FOR 15 MIN. 8'-0.5' 8-2-73

* Elev. Estimated from Preliminary Subd. Plan by Sunn, Low, Tom & Hara, Inc.

Dated 5/25/73

Standard Penetration Test
Boring Log

PROJECT: AIEA HILLSIDE SUBDIVISION
LOCATION: Aiea, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-07: 2

HAMMER:
Weight: 140 lbs
Drop: 90"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 5 Sheet No. of 3
Driller W. LUM ASSOC., INC. Date Aug. 3, 1973
Field Party ASATO, OSHIRO, KAINANA
Type of Boring AUGER (MOBILE) Diam. 3"
Elev. G94' ± 0 Datum
Drill Bit T.C. DRAG

LOCATION: Aiea, Ewa, Oahu, Hawaii

LOCATION: Field Part; ASATO, OSIRO, KAPUA

Hammer:

Description: MEDIUM, RED BROWN
          CLAYET SILT w/1 ORGANIC MATTER

(MH)

Description: STIFF, MOSILTED RED BROWN
          CLAYET SILT w/50%MB
          DECOMPOSED ROCK

(MH)

Description: DECOMPOSED ROCK

End of boring & 10' bore
8-3-73

Note: moved hole 4.0'
      rough drilling at 1.9'
      drill time 9.7' 15 min.
      end at 16.0' (8-4-73)

* Elev. Estimated from preliminary Subd. Plan by:
  Sunn, Low, Tom & Hara, Inc.
  Dated 5/25/73

PENETRATION DATA

ELEV. = G94' ± 0

Sample No. | Wet Cont. | Dry Cont. | Unconf. Comp. | Vane Shear |
---|---|---|---|---|
5-A | 28 | - | - | - |
5-B | 90 | - | - | - |
5-C | 21 | - | - | - |
5-D | 13 | - | - | - |

N (Blows per foot) 0 10 20 30 40

5/0.5' 10/5.5'
5/5' 2'
# Boring Log

**PROJECT**  AIEA HILLSIDE SUBDIVISION  
**LOCATION**  Aiea, Ewa, Oahu, Hawaii  
**Tax Map Key:**  9-9-07: 2

**HAMMER:**  
- **Weight:** 140 lbs  
- **Drop:** 30"  

**SAMPLER:**  2" STANDARD SPLIT SPOON

**LOCATION**  Aiea, Ewa, Oahu, Hawaii  
**Field Party:**  SETO, KAIMANA  
**Type of Boring:**  AUGER (MOBILE)  
**Boring No.:**  C  
**Date:**  7-25-73  
**Driller:**  W. LUM ASSOC., INC.  
**Date:**  JULY 25, 1973  
**Diameter:**  4"  

### Unified Soil Classification

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
<th>Depth (ft)</th>
<th>Sample No.</th>
<th>Wet Pen. (P.C.F.)</th>
<th>Dry Pen. (P.C.F.)</th>
<th>Unconf. Comp.</th>
<th>Vane Shear (P.S.E.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(MH)</td>
<td>STIFF, REDDISH BROWN SILTY CLAY W/ROOTS</td>
<td>1.0</td>
<td>G-A</td>
<td>26</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(MH)</td>
<td>STIFF, REDDISH BROWN SILTY CLAY W/TRACES OF ROOTS</td>
<td>5.0</td>
<td>G-B</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MH</td>
<td>STIFF, REDDISH BROWN SILTY CLAY W/SOME DECOMPOSED ROCK</td>
<td>10.0</td>
<td>G-C</td>
<td>36</td>
<td>LL: 80</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(MH)</td>
<td>STIFF, MOTTLED REDDISH BROWN &amp; GRAY CLAYEY SILT</td>
<td>15.0</td>
<td>G-D</td>
<td>44</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>END OF BORING @ 16.5'</td>
<td></td>
<td>G-E</td>
<td>44</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Penetration Data

- **N (Blows per foot):**
  - 0 10 20 30 40

### Notes:
- **LL:** LIQUID LIMIT  
- **PL:** PLASTIC LIMIT  

*Elev. Estimated from Preliminary Subd. Plan by Sunn, Low, Tom & Hara, Inc. Dated 5/25/73*
# Boring Log

**PROJECT**
AIEA HILLSIDE SUBDIVISION

**LOCATION**
Aiea, Ewa, Oahu, Hawaii

**Tax Map Key**
9-9-07: 2

**HAMMER**

<table>
<thead>
<tr>
<th>Weight</th>
<th>Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>140#</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

**SAMPLER**
2" STANDARD SPLIT SPOON

---

**BORING NO.**
7

**Sheet No.**
1 of 2

**Driller**
W. LUM ASSOCIATES, INC.

**Date**
JULY 28, 1973

**Field Party**
RADOVICH, KITAKA, OSHIRO, KAMANA, ASATO

**Type of Boring**
FINGER TYPE

**Elev.**
G 94.4

**Water Level**
100'-120'

**Time**
6:55-7:00

**Date**
7-28-73

---

**Standard Penetration Data**

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>T-A</th>
<th>T-B</th>
<th>T-C</th>
<th>T-D</th>
<th>T-E</th>
<th>T-F</th>
<th>T-G</th>
<th>T-H</th>
<th>T-I</th>
<th>T-J</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>26</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>34</td>
<td>45</td>
<td>57</td>
<td>48</td>
<td>37</td>
<td>10</td>
</tr>
</tbody>
</table>

**Penetration Test**

<table>
<thead>
<tr>
<th>N (Blows per foot)</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5/6.5</td>
<td>10/6.5</td>
<td>48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Description**

- **ELEV. G 94.4 + 0.0**
  - STIFF, BROWN SILTY CLAY
  - TRACES OF ROOTS

- **ELEV. G 94.2 + 0.0**
  - STIFF, MOTTLED REDDISH BROWN SILTY CLAY WITH TRACES OF DECOMPOSED ROCK

- **ELEV. G 93.8 + 0.0**
  - STIFF, MOTTLED REDDISH BROWN SILTY CLAY

- **ELEV. G 93.8 + 0.0**
  - STIFF, MOTTLED RED BROWN SILTY CLAY

- **ELEV. G 93.8 + 0.0**
  - STIFF, MOTTLED DARK BROWN CLAYET SILT

- **ELEV. G 93.2 + 0.0**
  - STIFF, MOTTLED DARK BROWN-GRAY CLAYET SILT WITH TRACES OF DECOMPOSED ROCK

- **ELEV. G 92.6 + 0.0**
  - GRAY, CLAYET SILT + DECOMPOSED ROCK

---

**End of Boring, 7-31-73**

* Elev. Estimated from Preliminary Subd. Plan by Sunn, Low, Tom & Haru, Inc.

Dated 5/25/73
## Boring Log

**PROJECT:** AIEA HILLSIDE SUBDIVISION  
**LOCATION:** Aiea, Ewa, Oahu, Hawaii  
**Tax Map Key:** 9-9-07: 2  
**HAMMER:**  
- **Weight:** 140#  
- **Drop:** 30"  
**SAMPLER:** 2" STANDARD SPLIT SPOON

### Unified Soil Classification

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEV. = G42' 3&quot;</td>
<td>STIFF, REDDISH BROWN SILITY CLAY W/ROOTS</td>
</tr>
<tr>
<td>(MH)</td>
<td>STIFF MOTTLED BROWN/GRAY CLAY/SILT W/SOME DECOMPOSED ROCK</td>
</tr>
<tr>
<td>(MH)</td>
<td>STIFF TAN, BROWN/GRAY CLAY/SILT &amp; DECOMPOSED ROCK</td>
</tr>
</tbody>
</table>

**END OF BORING @ 12' 8-1-73**  
**NOTE:** DRILL RATE  
- 110'-11.8' - 1 HR 30 MIN  
- 11.8' - 120' - 30 MIN.

* Elev. Estimated from Preliminary Subd. Plan by Sunn, Low, Tom & Hara, Inc. Dated 5/25/73

### Penetration Data

<table>
<thead>
<tr>
<th>Standard Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (Blows per foot)</td>
</tr>
</tbody>
</table>

**Boring No.** 8  
**Sheet No.** of  
**Date:** JULY 31 & AUG. 1, 1973  
**Driller:** W. LUM ASSOC., INC.  
**Field Party:** ASATO, KAIMANA, OSHIRO  
**Type of Boring:** AUGER (MOBILE)  
**Diam.:** 3"  
**Elev. Drill Bit:** FINGER TYPE  
**T.C. DRAG**  
**Water Level:** Noted  
**Time:**  
**Date:** 8-1-73  

*Penetration Test Data Table*
### Table I.A - Summary of Laboratory Test Results

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>SAMPLE NO.</th>
<th>DEPTH BELOW SURFACE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SURFACE 10'-11.5'</td>
<td>REDDISH BROWN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10'-21.5'</td>
<td>MOTTLED BROWN &amp; BROWN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20'-21.5'</td>
<td>MOTTLED GRAY &amp; BROWN</td>
</tr>
</tbody>
</table>

### Grain-Size Analysis (% Passing)

<table>
<thead>
<tr>
<th>Sieve</th>
<th>1&quot;</th>
<th>1/2&quot;</th>
<th>#4</th>
<th>#10</th>
<th>#20</th>
<th>#40</th>
<th>#100</th>
<th>#200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Atterberg Limits

<table>
<thead>
<tr>
<th></th>
<th>Air Dried or Natural</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>Plasticity Index</th>
<th>Dilatancy</th>
<th>Toughness</th>
<th>Dry Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NATURAL</td>
<td>NATURAL</td>
<td>NATURAL</td>
<td>NATURAL</td>
<td>SLOW-MED</td>
<td>MEDIUM</td>
<td>MED-HIGH</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>68</td>
<td>97</td>
<td>92</td>
<td>SLOW-MED</td>
<td>HIGH</td>
<td>MED-HIGH</td>
</tr>
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</table>

### Unified Soil Classification

<table>
<thead>
<tr>
<th></th>
<th>MH</th>
<th>CH</th>
<th>MH</th>
<th>MH</th>
</tr>
</thead>
</table>

### Apparent Specific Gravity

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
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</thead>
</table>

### Expansion and CBR Tests

<table>
<thead>
<tr>
<th>(Surcharge-51 P.S.F.)</th>
<th>Molding Moisture, %</th>
<th>Molding Dry Density, P.C.F.</th>
<th>Swell upon saturation, %</th>
<th>CBR at 0.1&quot; Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26.3</td>
<td>94.4</td>
<td>3.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>

### Moisture-Density Relations of Soils

<table>
<thead>
<tr>
<th>(AASHO T-180-57 Method)</th>
<th>Dry to Wet or Wet to Dry</th>
<th>Max. Dry Density (P.C.F.)</th>
<th>Optimum Moisture (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

### Remarks:

Date 8-13-73  By 5/6

WALTER LUM ASSOCIATES, INC.  CIVIL, STRUCTURAL, SOILS ENGINEERS
# Summary of Laboratory Test Results

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>3</th>
<th>3</th>
<th>4</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE NO.</td>
<td>0</td>
<td>F</td>
<td>SURFACE</td>
<td>5' - 6.5'</td>
</tr>
<tr>
<td>DEPTH BELOW SURFACE</td>
<td>10' - 11.5'</td>
<td>20' - 21.5'</td>
<td>MOTTLED BROWN</td>
<td>MOTTLED REDDISH-BROWN</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>SILTY CLAY</td>
<td>GREY CLAY</td>
<td>MUDROCKS</td>
<td>ORGANIC MATTER &amp; SAND</td>
</tr>
</tbody>
</table>

### Grain-Size Analysis

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Passing</th>
</tr>
</thead>
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<tr>
<td>1&quot;</td>
<td>100</td>
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<tr>
<td>1/2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>#4</td>
<td>99.7</td>
</tr>
<tr>
<td>#10</td>
<td>99.0</td>
</tr>
<tr>
<td>#20</td>
<td>98.4</td>
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<td>#100</td>
<td>97.3</td>
</tr>
<tr>
<td>#200</td>
<td>96.8</td>
</tr>
</tbody>
</table>

### Atterberg Limits

<table>
<thead>
<tr>
<th>Atterberg Limit</th>
<th>Natural</th>
<th>Natural</th>
<th>Natural</th>
<th>Natural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Dried or Natural</td>
<td>79</td>
<td>74</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>40</td>
<td>42</td>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td>Plastic Limit</td>
<td>39</td>
<td>32</td>
<td>39</td>
<td>22</td>
</tr>
</tbody>
</table>

### Unified Soil Classification

- MH

### Apparent Specific Gravity

- 

### Expansion and CBR Tests

- **Surcharge: 51 P.S.F.**
- Molding Moisture, %
- Molding Dry Density, P.C.F.
- Swell upon saturation, %
- CBR at 0.1" Penetration
- 24.3
- 60.1
- 1.3
- 14.0

### Moisture-Density Relations of Soils

- **AASHTO T-180-57 Method**
- Dry to Wet or Wet to Dry
- Optimum Moisture (%)

### Remarks:

Date: 8-13-73
By: W L
TABLE I.C - SUMMARY OF LABORATORY TEST RESULTS

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>SAMPLE NO.</th>
<th>DEPTH BELOW SURFACE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>5'-6.5'</td>
<td>REDISH-BROWN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SILO CLAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WISCONSIN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DECOMP. ROCK</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>10'-11.5'</td>
<td>BROWN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MOTTLED</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SILO CLAY</td>
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<td></td>
<td>WISCONSIN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DECOMP. ROCK</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>13'-14.5'</td>
<td>SILO CLAY</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>WISCONSIN</td>
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<tr>
<td></td>
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<td>DECOMP. ROCK</td>
</tr>
</tbody>
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**GRAIN-SIZE ANALYSIS**

(% Passing)

<table>
<thead>
<tr>
<th>Sieve</th>
<th>6</th>
<th>7</th>
<th>7</th>
<th>8</th>
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<td>1&quot;</td>
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<td>100</td>
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<td>100</td>
</tr>
<tr>
<td>1/2&quot;</td>
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<td>99.1</td>
<td>99.4</td>
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<tr>
<td>#4</td>
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<td>97.3</td>
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<td>97.3</td>
</tr>
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<td>97.3</td>
<td>97.3</td>
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<tr>
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<td>96.2</td>
<td>97.3</td>
<td>97.3</td>
<td>97.3</td>
</tr>
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<td>96.2</td>
<td>97.3</td>
<td>97.3</td>
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</tbody>
</table>

**ATTERBERG LIMITS**

- Air Dried or Natural
  - Liquid Limit
  - Plastic Limit
  - Plasticity Index
  - Dilatancy
  - Toughness
  - Dry Strength

**UNIFIED SOIL CLASSIFICATION**

| MH | MH | MH-CH | MH |

**APPARENT SPECIFIC GRAVITY**

**EXPANSION AND CBR TESTS**

(Surcharge-51 P.S.F.)

- Molding Moisture, %
- Molding Dry Density, P.C.F.
- Swell upon saturation, %
- CBR at 0.1" Penetration

**MOISTURE-DENSITY RELATIONS OF SOILS**

(AASHO T-180-57 Method)

- Dry to Wet or Wet to Dry
- Max. Dry Density (P.C.F.)
- Optimum Moisture (%)

**REMARKS:**

Date 8-13-73  By  P.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
PLASTICITY CHART

PROJECT: AIEA HILLSIDE SUBDIVISION
LOCATION: AIEA, EWA, OAHU, HAWAII

DATE 8-13-13  BY  FJ  
WALTER LUM ASSOCIATES, INC.  
CIVIL, STRUCTURAL, SOILS ENGINEERS
MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

PROJECT: AIEA HILLSIDE SUBDIVISION

LOCATION: AIEA, EWA, OAHU, HAWAII

SAMPLE NO.: 1 SURFACE

SAMPLE DESCRIPTION: BROWN SILTY CLAY W/TRACES OF ROOTS

AGGREGATE: 1/4" MINUS
MOLD SIZE: 4" x 4.584" HIGH
HAMMER: 10 LBS. 18" DROP
LAYERS: 5
BLOWS: 25/LAYER

MAXIMUM DRY DENSITY: 91.4 P.C.F.

OPTIMUM MOISTURE CONTENT: 5.7%

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 8-3-73  BY  JS
CBR TEST

PROJECT: AIEA HILLSIDE SUBDIVISION

LOCATION: AIEA, EWA, CAHU, HAWAII

SAMPLE NO: 1 SURFACE

SAMPLE DESCRIPTION: REDDISH-DROWN SILTY CLAY W/ROOTS

TEST RESULTS:

MOLDING MOISTURE, %: 26.8
MOLDING DRY DENSITY, P.C.F.: 94.4
CBR @ 0.1" PENETRATION: 2.5
DAYS SOAKED: 4

DATE 6-6-73 BY TK

DATE 6-7-73 BY N1

CBR PENETRATION DATA

<table>
<thead>
<tr>
<th>PENETRATION (INCHES)</th>
<th>LOAD (LBS)</th>
<th>LOAD (PSI)</th>
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<tbody>
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<td>8</td>
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<tr>
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<tr>
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AGGREGATE ⅛" MINUS
HAMMER WEIGHT 10 LBS
HAMMER DROP 18"
No. OF BLOWS 56/LAYER
No. OF LAYERS 5

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470
CBR TEST

PROJECT: AIEA HILLSIDE SUBDIVISION
LOCATION: AIEA, EWA, OAHU, HAWAII
SAMPLE NO: 4 SURFACE
SAMPLE DESCRIPTION: MOTTLED BROWN SILTY CLAY W/ROOTS

CBR PENETRATION DATA

<table>
<thead>
<tr>
<th>PENETRATION (INCHES)</th>
<th>LOAD (LBS)</th>
<th>LOAD (PSI)</th>
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<tbody>
<tr>
<td>0.025</td>
<td>100</td>
<td>55</td>
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<tr>
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<tr>
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<td>0.100</td>
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<td>0.125</td>
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<td>0.175</td>
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</table>

AGGREGATE 1/4" M I N U S
HAMMER WEIGHT 10 LBS
HAMMER DROP 16"
No. OF BLOWS 56/LAYER
No. OF LAYERS 5

TEST RESULTS:
MOLDING MOISTURE, % 34.3
MOLDING DRY DENSITY, P.C.F. 66.7
CBR @ 0.1" PENETRATION 14.6
DAYS SOAKED 5

DATE 6-13-73 BY LAI & LY
DATE 6-14-73 BY N1

WALTER LUM ASSOCIATES, INC.
CIVIL STRUCTURAL SOILS ENGINEERS
CBR TEST

PROJECT: AIEA HILLSIDE TERRACE

LOCATION: AIEA, EWA, OAHU, HAWAII

SAMPLE NO: 7 SURFACE

SAMPLE DESCRIPTION: BROWN SILTY CLAY W/TRADES OF ROOTS

TEST RESULTS:

MOLDING MOISTURE, %. 30.2
MOLDING DRY DENSITY, P.C.F. 88.5
CBR @ 0.1" PENETRATION 21.0
DAYS SOAKED 4

DATE 8-7-73 BY LY
DATE 8-8-73 BY JS

CBR PENETRATION DATA

<table>
<thead>
<tr>
<th>PENETRATION (INCHES)</th>
<th>LOAD (LBS)</th>
<th>LOAD (PSI)</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>0.050</td>
<td>35.0</td>
<td>117</td>
</tr>
<tr>
<td>0.075</td>
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<tr>
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AGGREGATE 1/4" MINUS
HAMMER WEIGHT 10 LBS
HAMMER DROP 18"
No. OF BLOWS 56/LAYER
No. OF LAYERS 5

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
CBR TEST

PROJECT: AIEA HILLSIDE SUBDIVISION

LOCATION: AIEA, EWA, OAHU, HAWAII

SAMPLE NO: 8 SURFACE

SAMPLE DESCRIPTION: BROWN SILTY CLAY WITH TRACES OF ROOTS

CBR PENETRATION DATA

<table>
<thead>
<tr>
<th>PENETRATION (INCHES)</th>
<th>LOAD (LBS)</th>
<th>LOAD (PSI)</th>
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</thead>
<tbody>
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AGGREGATE 1/4" MINUS
HAMMER WEIGHT 10 LBS
HAMMER DROP 18"
No. OF BLOWS 56/LAYER
No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %: 38.2
MOLDING DRY DENSITY, P.C.F.: 85.9
CBR @ 0.1" PENETRATION: 21.7
DAYS SOAKED: 4

DATE 8-7-73 BY LY
DATE 8-8-73 BY JS

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
SECTION
NOT TO SCALE

FIGURE 1
PROPOSED BOULDER FILL
AIEA HILLSIDE SUBDIVISION
AIEA, EWA, OAHU, HAWAII
FIGURE 2
SUGGESTED FOOTINGS ON SLOPING GROUND
AIEA HILLSIDE SUBDIVISION
AIEA, EWA, OAHU, HAWAII

REINFORCING BAR TIES
(ASPHALT OR OIL WRAPPING
TO MINIMIZE CORROSION)

\( \frac{3}{4} \) IN.

\( 2 \frac{3}{4} \text{" PIPE}
\)
LENGTH VARIES
MIN. ABOUT 6 ft
MAX. ABOUT 20 ft

SECTION
NOT TO SCALE

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

AUGUST 1973
LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.